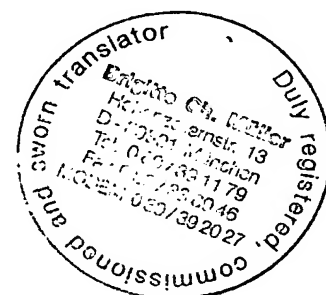


Patent Claims

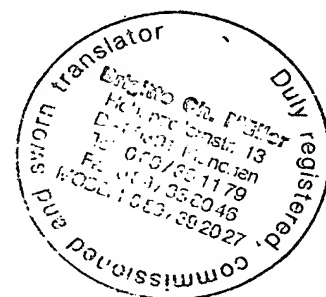
1. Heating device (2) for a fluid line (5, 50), in particular for a crankcase venting system of an internal combustion engine, with a heating element (3, 7) and with a holding device (4), through which the heating element can be fitted to the fluid line, **characterised in that** the heating device (2) exhibits a projection (9), in which the heating element (3, 7) can be held and which is adapted to be inserted in a well (20) with a well wall (14, 20', 30') of the fluid line (5, 50) adjacent to the inner space (15) of the fluid line (5, 50).
2. Heating device (2) according to Claim 1, **characterised in that** the holding device is provided with an elastic clamping section (10), which is arranged at least partially to abut against the outer wall (14) of the fluid line.
3. Heating device (2) according to Claim 2, **characterised by** a recess (11) formed between the projection (9) and the clamping section (10) and in which, at least partially, the outer wall (14) of the fluid line (5) can be accommodated.
4. Heating device according to one of the above mentioned claims, **characterised in that** the heating device (2) is formed as a module unit, in which the heating element (3) is preassembled in the holding device (4).
5. Heating device (2) according to one of the above mentioned claims, **characterised in that** the heating element (3) is formed in the shape of a plate.
6. Heating device (2) according to one of the above mentioned claims, **characterised in that** the projection (9) exhibits a polygonal cross-section transverse to the mounting direction, whereby a flat side of the polygon faces an inner space (15).
7. Heating device (2) according to one of the above mentioned claims, **characterised in that** the heating element (3) comprises a PTC heating element (7).



8. Heating device (2) according to Claim 7, **characterised in that** the PTC heating element (7) is arranged between two electrically conducting contact plates (6a, 6b), which continue in connector contact lugs (8a, 8b) to a plug connector.
9. Heating device (2) according to one of the above mentioned claims, **characterised in that** the projection (9) is formed by at least one contact plate (6a, 6b).
10. Heating device (2) according to one of the above mentioned claims, **characterised in that** at least one side of the projection (9) is formed by a contact plate (6a, 6b), which is designed so that it can be brought directly into contact with a well wall.
11. Heating device (2) according to one of the above mentioned claims, **characterised in that** at least one contact plate (6a, 6b) forms a spring section (46), which, with the projection (9) inserted into the well, is designed to press against the heating element elastically deformably through the well wall.
12. Heating device (2) according to one of the above mentioned claims, **characterised in that** the holding device (4) is provided with at least one guiding element (12), which is designed to guide the holding device (4) in an insertion direction (M) when the holding device is pushed into the fluid line (5).
13. Heating device (2) according to one of the above mentioned claims, **characterised in that** the holding device (4) is produced from an electrically insulating material.
14. Kit for a heating module (1) for fluid lines, in particular for crankcase venting systems of an internal combustion engine, with a tubular fluid line (5, 50) and with a heating device (2) mounted on the fluid line, **characterised in that** the heating device (2) is arranged according to one of the above mentioned claims.
15. Kit according to Claim 14, **characterised in that** also a thermally conducting element (51) is included, which is arranged for accommodation in the fluid line (5, 50).
16. Kit according to Claim 15, **characterised in that** the thermally conducting element (51) surrounds an inner space (15) of the fluid line (5, 50), at least partially.



17. Fluid line (5, 50), in particular for a crankcase venting system of an internal combustion engine, with a tubular line section, which is surrounded by an outer wall (14), **characterised by a well (20)**, at least one well wall (14, 20', 30') of which is adjacent to the inner space (15, 31, 32) of the fluid line (5) and which is designed for accommodating through insertion a heating element and a holding device by which the heating element can be mounted on the fluid line.
18. Fluid line (5, 50) according to Claim 17, **characterised in that** the well is formed between an inner surface facing the inner space (15) of the fluid line (5, 50) and an outer surface of the outer wall (14) facing outwards.
19. Fluid line (5, 50) according to Claim 17 or 18, **characterised in that** the well (20) is arranged in a region in which the wall thickness of the outer wall (14) is increased with respect to the surrounding regions.
20. Fluid line (5, 50) according to one of the Claims 17 to 19, **characterised in that** the well (20) opens in a radially parallel direction.
21. Fluid line (5, 50) according to one of the Claims 17 to 20, **characterised in that** the well (20) opens in the longitudinal direction of the fluid line (5, 50).
22. Fluid line (5, 50) according to one of the Claims 17 to 21, **characterised in that** the well walls extend into the interior (15) of the fluid line (5, 50) and in operation have fluid flowing around them.
23. Fluid line (5, 50) according to Claim 17, **characterised in that** the well walls form a projection protruding into the interior (15).
24. Fluid line (5, 50) according to Claim 17, **characterised in that** the well walls form a partition (32), which subdivides the interior (15) of the fluid line piece in flow regions separated from one another.



25. Fluid line (5, 50) according to one of the Claims 17 to 24, **characterised in that** the well (20) exhibits a quadrangular section in the direction transverse to the mounting direction, whereby at least one flat side of the quadrangle faces the inner space (15).
26. Fluid line (5, 50) according to one of the Claims 17 to 25, **characterised in that** the inner surface of the outer wall (14) facing the inner space of the fluid line exhibits a flat section (18).
27. Fluid line (5, 50) according to one of the Claims 17 to 26, **characterised in that** the outer wall (14) exhibits at least one guide element (21) by which the heating device can be guided in an insertion direction (M).
28. Fluid line (5, 50) according to Claim 27, **characterised in that** the guide device (21) comprises at least one groove.
29. Fluid line (5, 50) according to one of the Claims 17 to 28, **characterised in that** the outer wall (14) exhibits at least one weakened region (21) by which a local limited deformation of the well (20) can be realised by the action of force (F).
30. Fluid line (5, 50) according to Claim 29, **characterised in that** the weakened region (21) is formed groove shaped.
31. Fluid line (5, 50) according to Claim 29 or 30, **characterised in that** the weakened region (21) is formed in the outer surface (19) of the outer wall (14).
32. Fluid line (5, 50) according to one of the Claims 29 to 31, **characterised in that** the weakened region (21) overlaps the well (20) in the radial direction.
33. Fluid line (5, 50) according to one of the Claims 17 to 32, **characterised in that** the fluid line (5, 50) is produced from a thermally conducting metallic material.
34. Fluid line (5, 50) according to one of the Claims 17 to 33, **characterised in that** the well (20) is separated by the external wall (14) from the inner space (15) of the fluid line.



35. Fluid line (5, 50) according to one of the Claims 17 to 34, **characterised in that** the fluid line (5, 50) is formed as an angled element in which the fluid flow direction in operation can be deviated by a certain angle.
36. Fluid line (5, 50) according to Claim 35, **characterised in that** the well (20) is arranged in a front surface of the fluid line (5, 50).
37. Fluid line (5, 50) according to one of the Claims 17 to 36, **characterised in that** the fluid line (5, 50) is formed as a tubular element (5).
38. Fluid line (5, 50) according to one of the Claims 17 to 36, **characterised in that** the fluid line (5, 50) is formed as a valve (50).
39. Kit for a heating module for fluid lines (5, 50), in particular for crankcase venting systems of an internal combustion engine, with a tubular fluid line and with a heating device which can be mounted on the fluid line, **characterised in that** the fluid line (5, 50) is formed according to one of the Claims 17 to 38.
40. Heating module with a fluid line (5, 50) forming an outer wall (14), in particular for the crankcase venting of an internal combustion engine, and with a heating device (2) mounted on the fluid line (5, 50), the said heating device comprising a heating element (3) acting on the outer wall (14) and a holding device (4) holding the heating element (3) on the fluid line (5, 50), **characterised in that**, in the fluid line (5, 50), a well (20) is formed, in which a projection (9) of the heating device (2) holding the heating element (3) is accommodated and of which at least one well wall (14, 20', 30) borders the inner space (15, 31, 32) of the fluid line (5, 50).
41. Heating module (1) according to Claim 40, **characterised in that** the holding device (4) is held by repeated positive locking on the fluid line (5, 50).
42. Heating module (1) according to Claim 40 or 41, **characterised in that** the clamping section is latched into the well on the fluid line in the insertion direction of the projection.



43. Heating module (1) according to one of the Claims 40 to 42, **characterised in that** the outer wall (14) is plastically deformed at least in the region of the well (20).
44. Method for the manufacture of a heating module for a fluid line, in particular for crankcase venting in an internal combustion engine, comprising the following method step:
- Insertion of a heating element (3, 7) arranged on a projection (9) of a heating device (2) in a well (20) adjacent to an inner space of the fluid line (15, 50) in the outer wall of the fluid line.
45. Method according to Claim 44, comprising the following method step:
- Clamping the holding device firmly to the outer wall.
46. Method according to Claim 44 or 45, comprising the following method steps:
- Preassembly of the heating element and holding device to form a module unit;
 - Mounting of the module unit on the fluid line.
47. Method according to one of the Claims 44 to 46, comprising the following method step:
- Deformation of the fluid line with the inserted heating element and simultaneous pressing of the heating element in the well.

